

Rhadinaphelenchus cocophilus, A Potential Foreign Threat to Florida Palms

by R. P. Esser

History: Symptoms of red ring disease were first described from Trinidad in 1905. In 1919 N. A. Cobb showed the red ring nematode, Rhadinaphelenchus cocophilus, to cause this disease.

Geographic Range: The disease is reported in Central America from Honduras, British Honduras, El Salvador, Costa Rica, and Panama; in South America from Columbia, Venezuela, British Guiana, Surinam, and Brazil; in the West Indies from the islands of Grenada, St. Vincent, Barbados, Tobago and Trinidad. It is also reported from the Belgian Congo and Mexico.

Plant Hosts: Canary Island date palm (Phoenix canariensis), coconut palm (Cocos nucifera), Cuban royal palm (Roystonea regia), date palm (Phoenix dactylifera), and oil palm (Elaeis guineensis) have been reported as hosts.

Economic Importance: In Trinidad 35% of the young coconut trees are killed by this pest. One coconut plantation in Tobago lost 80% of its young trees. In Venezuela 35% of the oil palms have been lost in 10 years.

Symptoms: Two distinct symptom expressions are caused by this pest: "Red Ring" and "Little Leaf Disease."



Fig. 1 Little leaf symptoms on coconut palm (after Van Hoof and Seinhorst).



Fig. 2 Deformed leaves of oil palm due to little leaf disease (after Van Hoof and Seinhorst).

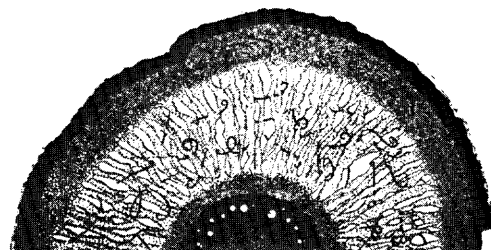


Fig. 3 Cross section of a red ring nematode infected root (after Cobb).

Red Ring Symptoms: Young trees 4-7 years old are most often attacked. When symptoms appear the tree is doomed. Leaves become discolored; fronds turn yellowish bronze, red-brown and then begin to wilt; and lower fronds turn yellow from tip to petiole progressively. The entire crown turns yellow and heart leaves turn yellow or grey. In affected trees 10 years or older, leaves are brown, dead and collapsed downward. Inside the leaf red spots or red and yellow streaks appear. Flowers die and are shed both closed and open. Green nuts of all sizes fall from the tree. If the trunk is cut crosswise 1-7 feet above the soil line a distinct red ring will be seen about 2 inches internally. The red ring is sometimes tinged with yellow. Root bark sloughs off and becomes dry and flaky. Roots change color from white to yellow, pink, dark yellow or red-brown. Death occurs to the palm 6-20 weeks after symptoms appear.

Little Leaf Disease Symptoms: Symptoms rarely occur on coconut palm (Fig. 1) but are common on oil palm. Leaves are erect, short and deformed (Fig. 2). Pinnae are short, wiry, damaged, and necrotic at tips. Yellow patches appear on petioles and leaf bases. Older leaves are yellow to grey.

Life Cycle: Twenty days after inoculating 3-10 year old trees, all stages of the nematode were recovered from the tissue. Nematodes reared in 4-5 month old immature nuts completed their life cycle in 9-10 days. Nuts initially turned brown where infected, and turned completely brown in 20 days.

Nematode Transmission: Principle means of infection is by palm weevils (Rhynchophorus palmarum). Palm weevils become infested externally and internally when feeding in infested tissue. Over 35% of weevils collected in the field at random were found infested externally. In the weevil burrows 116 of 163 weevil larvae and 173 of 202 pupae were found internally infested with R. cocophilus. Virgin weevils were found infested internally and externally. Weevils walking through a suspension of nematodes picked up 87 nematodes in 10 seconds. Nematodes live 10 days in the weevil gut and 8 days on the weevil body. Weevils with nematodes on or in their bodies and on particles of adherent frass fly to palm trees initiating new infections. Infection usually occurs in leaf axils, by nematodes coming from the weevil proboscis, excrement, adherent frass, or the weevil body. One gram of weevil frass from a leaf petiole yielded 1,258 nematodes.

Palms also become infected by nematodes entering roots from soil, or by infected roots touching healthy roots in soil. Nematodes infect leaves by entering leaf stomata. The pest has been found in the husks of fallen nuts. They have been observed carried by ants, and also inhabiting termite (Coptotermes niger) colonies.

Infection: Soft, hard or undamaged palm tissue is invaded by the nematode. In roots, cortical root tissue is invaded (Fig. 3). In leaves and stem the nematodes invade intercellular spaces and sometimes the cell. In plant tissue nematodes may move 2 1/2 inches in 4 days. Internal damage is evident 14-21 days after nematodes enter tissue. External symptoms appear 21-70 days after entry of the pest. Water conducting vessels are obstructed by the nematodes. Nematodes infest the stem to about 8 feet above the soil line. The heaviest populations are 6-12 inches below the red ring upper limit. Ten grams of infected stem tissue has yielded fifty thousand nematodes. The nematode is unique in that it inhabits the interior above ground bole of palm trees.

Season: Heaviest losses occur in December and March. Severe outbreaks occur during periods of heavy rainfall. The disease is more prevalent in poorly drained swampy areas.

Control: Zinophos at a rate of 1:1000 injected into healthy coconut roots protected the roots from the pests. The disease was reduced further by applying the insecticide Palmarol (19.5% endrin and coumarone) in the leaf axils of healthy palms. Infected trees may also be burned and the soil treated with DD at a rate of 400 lbs/acre. Seed nuts from infested areas should not be used in uninfested areas.

Regulatory Significance: This pest forms a geographic semicircle just south of Florida. It could enter Florida many ways and, once in, become of regulatory as well as economic importance. Plant specialists should be alert to any suspicious dying off of young coconut palms. In particular the distinct red ring in cross sections of fresh cut coconut palms should be watched for.

Note: Seventy-eight references were used. All are filed under Rhadinaphelenchus cocophilis in the Nematology section pathogen file.